Pediatric Resident's Perception of Night Float System Compared to 24 Hours System, a Prospective Study

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Research article

Keywords: duty hour, post-graduate, residency, well-being, work schedule tolerance, night float

Posted Date: November 2nd, 2020

DOI: https://doi.org/10.21203/rs.3.rs-31495/v2

Version of Record: A version of this preprint was published on January 6th, 2021. See the published version at https://doi.org/10.1186/s12909-020-02474-x.

Abstract

Background:

This study aims to evaluate the pediatric residents' perceptions of the Night Float (NF) on-call system and its impact on their well-being, education and patient safety and compare it with the previous traditional 24-hour on-call system.

Methods: This is a prospective study conducted in two pediatric residents training centers who applied the NF on call system as a pilot project. The senior residents (PGY-3 & PGY-4) enrolled in the two training centers were invited to participate in this study before changing the on-call system and 6 months after starting the new NF on-call system. A self-administered online questionnaire was distributed to them. A five-point Likert-type scale was used to rank the residents' responses (1 means strongly disagree & 5 means strongly agree), covering three main domains; residents' well-being, ability to deliver health care, and their medical education experience. Pre- and post-intervention scores were presented as means and compared using the t-test for paired samples.

Results: A total of 42 residents participated in the survey. Of these, 24 (57.1%) were females. All participants were senior residents; 25 (59.6%) were third year residents while 17 (40.4%) were fourth year residents. Participants felt that most aspects of the three domains were improved by the introduction of the NF system. The NF system was perceived to have less adverse health effect on the residents (Mean 2.37±1.01), compared to the 24 hours on-call system (Mean 4.19±0.60), P 0.001. The NF system was perceived to have less exposure to personal harm, less negative impact on the quality of care, better work efficiency, reduced potential for medical error, more successful teaching and fewer disruptions to other rotations compared to the 24 hours on-call system, (P 0.001).

Conclusion:

The senior residents' perception about the 24-hour on-call system has shown a negative impact on the residents' well-being and education of residents and patient safety compared to an on-call system with more restrictive duty hours. The perception of the restricted duty hours was perceived to be less harmful, more useful from pedagogic aspect and has positive impact on the quality of delivered health care services.

Background

For several decades, adjusting the duration of the working hours and the on-calls of the training residents have been a major concern for them worldwide as several studies regarding the traditional 24-hour on-call system reported that this on-call system has been associated with sleep deprivation and fatigue, which subsequently, resulted in increased medical errors and motor vehicle occlusions. Furthermore, an increase in incidence in burnout and suicide attempts among physicians have been reported. As a result, several

countries have established a new system of work coverage called the Night Float (NF) shifts system and abandon the traditional 24-hours on-call system [1-6].

The NF system is a work coverage system where the residents take care of patients for 12-16 hours either during daytime or nighttime [7]. Or in some contexts in order to conduct the NF system, the residents are divided into two alternating groups where one group work at nighttime, and the other work in the daytime [8]. On the other hand, traditional 24-hours on-call system is where doctors are responsible for receiving calls from the emergency department, or medical teaching unit for 24 hours [9].

In 2003, the Accreditation Council for Graduate Medical Education (ACGME) in the United States limited the working hours to 80 hours per week which restricted overnight shift length and assigned minimum out of duty hours between shifts [22,23]. In 2011, Quebec province in Canada restricted duty hours to not exceed more than 16 hours for a shift [10]. Also, Europe has implemented residents' duty hour restrictions [24]. In 2017, Korea has established the NF system for 6 months [8]. In Singapore, the NF system was applied for interns in the internal medicine department for a research study [6]. However, multiple studies have shown controversial results regarding the implementation of the NF shifts system [2]. In contrast, one of the drawbacks was reduced autonomy for cross-coverage interns [17]. Furthermore, decreased residents' opportunity for education and learning [18]. It was noticed that the mentality of residents appeared concentrated around hand-over as the number of sign-overs increased, shift time became stricter, and integration between daytime and NF was weak [19].

The Saudi Commission for Health Specialties introduced new guidelines regarding duty hour's regulations in 2014. Prior to that, the residents were expected to complete long hours of on-call and work shifts that could last more than 24 hours. The new regulations released in 2014 limited the number of the on-calls in the first two years of the training (junior residents) to a maximum of 7 on-calls per month while for the residents in the third and fourth year of the training (senior residents), the number of on-calls were limited to 6 on-calls per month. Additionally, the average duration of the on-calls should be 24 hours and residents should be off-duty maximally by midday on the day following their call.[1]

In this study, we evaluated the experience of pediatric senior residents with the duty hours after implementing the NF system as a pilot project in two pediatric residency training centers in Saudi Arabia and compared it to the traditional 24-hour on-call system in term of the senior residents' perceived effect on their health, education, patients care and safety.

Methods

This is a prospective study conducted in two pediatric residency training centers in Riyadh, Saudi Arabia from October 2018 to May 2019. Both training centers have a total of 86 residents (34 and 52 residents in each center) including 64 senior residents (25 and 39 senior residents in each center).

Both centers agreed to pilot the NF on call system for all the senior residents only (PGY-3 & PGY-4) as an academic quality improvement project in both training centers after receiving the approval of the pediatric

scientific council at the SCFHS and the senior residents from both centers.

The project involved changing the Residents' on-call shift from the previous 24- hour coverage to a day-float and night-float schedule for both, the weekdays and the weekends with a 9-hour day shift and 17-hour night shift. There was a scheduled, dedicated 1-hour overlap structured at shift change for effective handover. Residents in the NF senior residents generally works three or four consecutive nights, from 4 pm to 8 am, every seven days and does not have any daytime academic or clinical activities.

Before the beginning of this modality of on-call system, we administered a previously validated, evidence-based questionnaire to assess residents' perceptions of the implications of duty hour reform with permission from the author Fabreau G et al, 2013. [11].

Six months after the introduction of this new system of duty hours, this same questionnaire was sent to the trainee after ensuring that all senior residents were involved with the NF system (Appendix A). The questionnaire composed of Likert items that measured the degree to which participants agreed or disagreed with statements relating to the three main areas of the well-being of senior residents (16 items), the ability to provide quality health care (17 items), and experience in medical education (16 items).The responses to each item were coded as strongly disagree (1), disagree (2), neither agree nor disagree (3) agree (4) and strongly agree (5).

The primary outcome was the change in all senior pediatric residents' perceptions of theirwell-being, ability to deliver quality health care and medical education experience, pre- and post-intervention, as measured by the questionnaire.

This study received ethical approval from the Institutional Review Board (IRB) of King Saud University. Residents were informed that participation was not mandatory and assured of the anonymity and confidentiality of their responses. A written consent was obtained from the participants before their enrollment in this survey.

Statistical Data Analysis:

The means and standard deviations were used to describe the continuous variables, and the categorically measured variables were described using frequencies and percentages. The compute command in the analysis program was used to estimate the mean score for each domain using its sub-items after reverse coding the negatively worded statements to align their direction with their main sub-construct magnitude, i.e. agreement level. The paired samples t-test was used to assess the statistical significance on the mean indicators of physician satisfaction with the two used on-call systems. The SPSS IBM Version20 analysis program was used for the data analysis and the statistical significance level was considered at 0.050 Level.

Results

Participants

Forty-two residents of 86 residents (48%) responded to the survey. Survey response rates throughout this process remained at 48%. 24 residents (57.1%) were female residents; 25 residents (59.6%) were in the third year of training (PGY-3) and 17 (40.4%) residents were in the fourth year of training (PGY-4) as shown in Table 1.

Perceptions of the impact of the Night Float system

Well-being

Regarding the general well-being, the analysis showed that the residents perceived significantly more negative impact of the 24-oncall system on their general well-being compared to the NF system (general effects on health, restriction to physical activity, impairment to their circadian rhythm, overall fatigue and physical illness episodes, as well as more need to consume stimulants like coca cola and coffee), p 0.001. However, the NF system was associated significantly with enhanced energy levels than their working with the 24-hour on-call system, p=0.041.

Nonetheless, the perception of potential for harm for the two on-call systems was measured with two indicators. The analysis showed that the perception of potential harm with the 24-hour on-call system was significantly higher .

However, in terms of conflicting potential and resilience effects, the two on-call systems showed equivalent results that allowed to trade off on-call shifts with other residents, p=0.830. However, the residents found the 24-hour on-call system had significantly less permissive (access) to free time to accomplish errands, less family friendly and more restrictive to residents to do research than the NF on-call system (see Table 2).

With regards to the indicators of resident's relationships with others, the analysis showed that residents significantly felt more isolated in the 24-hours on-call system, but they had significantly better social relationships in NF system, p 0.001.

Ability to deliver quality health care

Importantly, the perception of the impact of these on call systems on the quality of delivered healthcare services by the residents to their patients were measured with four indicators. The data showed that the residents perceived that they were significantly less alert during the 24-hour on-call shifts in comparison with the NF system. Meanwhile, the residents perceived the 24-hour on-call system had significantly more association with preventable medical error density, more near missed errors, and more fatigue that impacted their patients care quality.

In regard to the impact of the two on-call systems on aspects of residents' expertise, the residents perceived that with the 24-hour on-call system they would significantly miss more important diagnoses of their patients, less ability to manage complex medical issues, less accurate medical handovers and less accountability to patients care, p 0.001 in comparison to the NF system. As shown in the Table 2.

Medical education experience

Table 2 displays the residents' responses on the aspects of emotional burden, efficiency of work, education, skills, learning ability, supervision, experiencing interruptions during rotations and post on-call. The analysis of the emotional burden on the residents showed that the residents had experienced significantly greater interaction and communication with their patients during the NF on-calls compared with their 24-hour on-call system. However, the data showed that the two on-call systems had nearly equivalent sensitivity to social issues related to their patients care and care planning like cultural and gender sensitivities, P=0.486. Moreover, the analysis of the indicators of work efficiency showed that the residents had perceived significantly less multitasking ability, less hand over efficiency and less ability to attend pager buzzes during the 24-hour on-calls system compared to the NF on-calls, p 0.001 each respectively.

In addition, the teaching of junior residents and clerks were significantly less timely permissive and more energy consuming with the 24-hour on-call system than when they worked during the NF shift. However, their 24-hour on-call shifts were highlighted with less confidence to teach, less efficacy on teaching management of unstable patients, and teaching skills on running codes and managing patients in emergencies. The indicators of skillfulness, had suggested that residents were less confidence with doing medical procedures. Also, had less confidence and ability in managing critically ill patients and performing cardiopulmonary resuscitations during the 24-hour on-call shifts than during the NF shifts, p 0.050 each respectively.

The analysis of data regarding residents learning showed that residents perceived less acquisition of knowledge, less usage of new knowledge, less satisfaction with education and learning through simulation during their 24-hour on- call system compared to the NF systems, p 0.050 respectively. Furthermore, the residents had perceived their 24-hour on-call system as significantly less helpful for reviewing cases with peers, less permitting to in depth discussion of clinical skills with other peers and allowed less feedback from attending seniors when compared to their experiences during the NF episodes, p 0.050 each respectively.

The residents had perceived that the 24-hour on-call system is significantly more interruptive to ambulatory care rotations, more associated with post on-call call-backs and fatigue during weekends which affected their successive weekdays work rotations compared to their NF system, p 0.001 each respectively.

The overall rating of the different domains:

The analysis findings of the overall concepts with experiences of the two on-call systems showed that, the NF system had perceived significantly more positive impact on general wellness, more role resilient, healthier for residents' social and family relationships. On top of that, less exposure to harm and risk, less impact on the quality of care they had delivered to their patients while working, less disruptions during the

post NF system. Also, it showed more resilient with regards to emotional integrity of their patients care in comparison to the traditional 24-hour on-call system.

Furthermore, they perceived more work efficiency, higher teaching ability, higher skillfulness, better learning, and more efficient supervision during the NF on-calls. Means and standard deviations are shown in Table 3.

Figure 1. The senior residents' mean perceptions of the two on-call systems

Discussion & Literature Review

Our study demonstrated the experience of residents with the newly-implemented Night Float (NF) system in Saudi Arabia, comparing the pediatric residents experience and the impact of the NF system versus the traditional 24-hour on-call system.

Our findings support that NF system showed improved regarding rapid response to on-calls and better patient's management, as perceived by the senior residents who enrolled to this study, which is similar to the finding of another study conducted in Korea [8].

Furthermore, their study had showed decrease confusion and post-operative bleeding that we did not evaluate in our study [8]. Our study showed improvement regarding patient care, communication and physician sleep hours which is similar to another study that implemented the NF system on residents. Also, they found that NF system allowed more time for reading and family which is the same with our data that showed more free time to accomplish non-work related errands. In addition, it decreased fatigue, medical errors, and needle stick injuries [12]. The NF system was implemented in a group of interns in the internal medicine department in Singapore. They found that interns were satisfied regarding the implementation of the system, and thought the system decreased the incidence of medical errors, better physician health, and did not alter the quality of their education similar to our results [6]. However, other studies found worse patients' outcome that were associated with the NF implementation, especially in the surgical and critical care areas. Another adverse issue of the NF implementation was the increased operational cost, with patient's charges increasing from $70,900 to $96,100 ($p < 0.0001$) [20].

It is important to draw attention that residents' well-being will affect their education, patient care, and patient safety [13]. A study was conducted in Saudi Arabia supported the same finding in which the 24-hour on-call system had a negative outcome on the residents' health, education, and safety of the patients. It suggested to investigate the impact of the duration of time residents spend in the hospital on their clinical performance, education, and quality of patient management [1]. Our study, showed that NF system was perceived with significant improvement in these three aspects. Several studies showed the traditional on-call system is associated with loss of sleep and fatigue which is like our study results [2-3]. Furthermore, the 24 hour on-call system shown to negatively affect physical function and memory in our

pediatric residents and neurosurgery residents in another study [14]. On the other hand, others raised concern that such NF may adversely affect the physicians' training, with no significant difference in the time that medical interns spent on direct patient care and education between standard duty-hour policies and other more flexible NF policies [21].

Another study was done on neurosurgery residents showed that long and multiple shifts associated with burnout risk [4]. Another research emphasized the effect of stressful on-call duties, and long duty hours on the increase in the incidence of burnout [5]. In addition, a study suggested minimizing work hours and assigning health care workers to specific rules in order to prevent physician burnout [15]. Moreover, a survey advised a time off to improve residents' well-being as it showed that long duty hours could cause residents burnout which can cause depression, substance abuse, and suicide attempt [2-3, 5].

There were multiple surveys that have controversial results regarding the NF shifts in comparison to the traditional on-call system. Better ability to adapt to circadian rhythm changes and no restriction of physical activities were associated with NF shifts in our study while a study in Singapore showed no increase in sleep hours or reduce physical activity which contributes to the development of fatigue [2].

Also, there were some doubts that the NF system may reduce the quality of residents' education [8] as well as the education opportunities due to decreased interactions and conferences during the NF system [16]. We found that the perception of educational experiences and opportunities to learn procedures among senior pediatrics residents were in favor of the NF shifts. Furthermore, one of the proposed solutions to augment the NF with an intern to assist the on-call and a senior resident (labeled as the "nighthawk") to supervise inpatient care and improve communication for a better teaching during the NF system [17].

The limitation of our study were lack of assessment regarding the risk of motor vehicle accidents and near-miss driving events that could be related with loss of sleep and fatigue during long-time shifts. Also, we did not evaluate the cognitive function which is another limitation. However, as this study is a survey based on a self-administered questionnaire, it is subjected to recall bias and it is perception-based rather than objective. However, we consider that perceived impact of the NF system on the residents' wellbeing, education and the patients' safety is an important factor that influences these aspects.

Conclusion

The senior residents' perception about the 24-hour on-call system has shown a negative impacts on the well-being and education of residents and patient safety compared to an on-call system with more restrictive duty hours. The perception of the restricted duty hours were perceived to be less harmful, more useful from pedagogic aspect and has positive impact on the quality of delivered health care services. Pediatric residency training programs in Saudi Arabia should consider further evaluation for resident duty hours reform and evaluate new on-call models to improve resident well-being, training and improve patient care.

List Of Abbreviations

(NF) Night Float

(ACGME)Accreditation Council for Graduate Medical Education

(PGY-3) Level 3 resident

(PGY-4) Level 4 resident

Declarations

Ethics approval and consent to participate: Approved by Institutional Review Board King Saud University, Research Project number E-16-1908.

Consent for publication: A written consent was obtained from each participant upon the enrollment in the study.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: Nothing to declare

Funding: Not applicable

Authors' contributions:

FA: Proposal writing, IRB application, Consenting process, Data collection, Data analysis, Methodology, manuscript writing, Manuscript revision.

HA: Consenting process, Data collection and Manuscript revision.

HRA: Data analysis, manuscript writing and manuscript revision.

MA: Data analysis, manuscript writing and manuscript revision.

RA: Data analysis, manuscript writing and manuscript revision.

GA: Data analysis, manuscript writing and manuscript revision.

MAA: Data analysis, manuscript writing and manuscript revision.

WA: Consenting process, Data collection and Manuscript revision.

MT: Proposal writing, IRB application, methodology and manuscript revision.

ASA: methodology and manuscript revision.

AA: Proposal writing, IRB application, methodology and manuscript revision

All authors have read and approved the manuscript.

Acknowledgements: The authors thank the residents who participated in this survey and the staff of the academic department at the Saudi Commission for Health Specialties for facilitating the delivery of the survey to the pediatric residents. Lastly, the authors gratefully acknowledge the College of Medicine, the Medical Education Department, the Research

Center and the Deanship of Scientific Research at King Saud University, Riyadh,

Saudi Arabia.

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Tables

Table 1: Demographic and professional characteristics of the participants N=42.

	Frequency	Percentage
Male	18	42.9
Female	24	57.1
lency Level		
PGY-3	25	59.6
PGY-4	17	40.4

PGY-3: Level 3 resident, PGY-4: Level 4 resident

Table 2:

Change in senior residents' perceptions of the impact of the on-call system on items of the seniors' self/work Pre- and post-intervention (N = 42)

	Mean (SD)-likert agreement rating			
	hour 24 oncall system	Night float system	t/df=41	p-value
:T ON senior residents' WELLNESS				
eneral wellness				
ly affect my health	4.48 (0.92)	2.45 (1.27)	8.53	0.0>01
ts my participation in physical activity	4.67 (0.69)	2.38 (1.23)	11.45	0.0>01
s my ability to adapt to Circadian Rhythm s	4.33 (0.95)	2.55 (1.33)	7.85	0.003
utes to their overall sleep debt	4.57 (0.70)	2.71 (1.42)	7.74	0.0>01
utes to overall my fatigue levels	4.74 (0.59)	2.33 (1.26)	11.92	0.0>01
utes to frequent episodes of physical illness ds)	3.90 (1.08)	2.14 (1.22)	7.9	0.0>01
es my overall energy levels	2.86 (1.52)	3.60 (1.23)	2.11	0.041
utes to my need to use stimulants such as e	4.40 (0.89)	2.86 (1.24)	7.5	0.0>01
exposure to personal harm				
s safety while driving home when I am post	4.45 (0.86)	2.57 (1.19)	8.211	0.0>01
potential for workplace harm such as stick injuries)	4.10 (1.10)	2.21 (1.22)	9.3	0.0>01
conflicting role demands				
sy for me to trade on-call shifts with others	3.07	3.02	0.22	0.83

	(0.89)	(1.20)		
me free time to accomplish my non-work errands	2.57 (1.33)	4.07 (1.20)	5.1	0.0> 01
es opportunities to spend time with my	2.0 (1.15)	4.26 (1.08)	8.5	0.0> 01
ts my time available to do research	4.10 (0.98)	2.52 (1.27)	6.1	0.0> 01
healthy relationships				
healthy interpersonal relationships	2.55 (1.06)	4.17 (0.88)	6.86	0.0> 01
feelings of isolation me to feel isolated at times	4.17 (0.85)	2.60 (1.33)	6.57	0.0> 01
of Senior Resident Schedule on Seniors' to Deliver Quality Health CareAllows Allows al for error				
whole, do you feel alert during your ures while on call	1.1) 2.90 (	4.14 (0.72)	5.83	0.0> 01
commit preventable medical errors	3.64 (0.91)	2.55 (1.13)	5.23	0.0> 01
experience "near misses" related to poor care	3.86 (0.75)	2.52 (1.02)	6.95	0.0> 01
en too tired to provide safe patient care	3.83 (1.06)	(1) 2.14	7.8	0.0> 01
clinical skills expertise				
mportant diagnoses	3.83 (0.88)	2.17 (0.88)	9.62	0.0> 01
ge complex medical patients appropriately	3.0 (1.08)	3.98 (0.87)	4.34	0.0> 01
ntent of my patient care handover is	3.19	4.11	4.79	0.0>

te	(1.06)	(0.74)		01
	2.10	3.79		0.0>
rm a thorough work up of new admissions.	(0.96)	(1.18)	6.38	01
continuity of patient care				
ght important follow up items during	2.93	4.19		0.0>
er of patient care issues	(1.24)	(0.77)	5.4	01
	2.71	4.57		0.0>
ain continuity of patient care	(1.42)	(0.70)	7.74	01
	3.57	4.12		
ne accountability for the patients I admit	(0.89)	(0.83)	3.41	0.001
expenditure of emotional labour				
eractions with other MTU team members are	3.43	4.33		0.0>
e	(0.99)	(0.57)	4.86	01
	3.55	4.21		
unicate well with patients and their families	(1.04)	(0.81)	3.42	0.001
nsitive to social issues pertaining to patient	3.19	3.29		
.g. Gender and Culture)	(0.86)	(0.99)	0.703	0.486
work efficiency				
ble to effectively multitask during busy work	2.67	4.0		0.0>
	(1.18)	(0.99)	5.99	01
over patient care issues in a time efficient	2.93	4.19		0.0>
r	(1.24)	(0.77)	5.4	01
	3.19	4.12		
nd to pagers in a timely fashion	(1.21)	(0.86)	4.6	0.001
t of Senior Resident Schedule on				
rs' Medical Education Experience				
successful teaching				
enough time to teach junior residents and	2.19	3.83		
	(0.92)	(0.93)	7.84	0.001
enough energy to teach junior residents and				

	2.12 (0.92)	3.83 (1.06)	7.4	0.0> 01
nfident in my ability to teach procedural	3.10 (1.14)	3.90 (0.93)	3.14	0.003
nfident in my ability to teach how to e unstable critically ill patients	3.12 (1.10)	3.93 (0.95)	3.57	0.001
nfident in my ability to teach the skills of run a code	2.93 (1.11)	3.60 (0.96)	2.9	0.006
medical skills proficiency				
nfident in my ability to perform procedures	3.48 (0.92)	4.14 (0.65)	3.72	0.001
nfident in my ability to manage unstable ly ill patients	3.45 (0.80)	3.90 (0.88)	2.3	0.026
nfident in my ability to run a code	3.19 (1.02)	3.71 (0.97)	2.67	0.011
successful learning				
cquire new knowledge on call	3.33 (1.07)	4.12 (0.80)	3.76	0.001
etain new knowledge on call and apply it to care	3.38 (1.08)	4.12 (0.86)	3.26	0.002
rall education experience on call is ng	2.83 (0.99)	3.95 (0.91)	5.46	0.0> 01
opportunities to learn procedures through ion training	3.36 (1.06)	3.86 (0.93)	2.51	0.016
staff physician supervision				
he opportunity to review cases with ng physicians	2.95 (0.99)	3.79 (0.92)	4.14	0.0> 01
ical skills (history and physical) are ed by an attending physician	2.33 (1.0)	3.10 (1.16)	4.1	0.0> 01
e feedback from attending physicians				

	2.74 (1.06)	3.24 (1.19)	2.86	0.007
rotation disruptions				
ɔulatory care rotations are frequently pted due to MTU on call duties	3.95 (1.06)	2.38 (1.08)	5.55	0.0> 01

Table 3: Change in senior residents' perceptions of the impact of the on-call system on aspects of the seniors' self/work Pre- and post-intervention (N = 42)

	Mean (SD)-likert agreement rating			
	hour oncall-24 system	**Night float system**	t/df=41	p-value
esident wellness				0.00>
eneral wellness	(0.60) 4.19	(1.01) 2.37	11.32	1
xposure to personal harm	(0.8) 4.27	(1.07) 2.39	10.17	0.00> 1
onflicting role demands	(0.59) 2.74	(0.77) 3.71	5.63	0.00> 1
ealthy relationships	(0.76) 2.19	(0.99) 3.79	7.4	0.00> 1
eelings of isolation	(0.85) 4.17	(1.33) 2.60	6.57	0.00> 1
deliver quality health				
otential for error	(0.67) 3.61	(0.79) 2.27	7.8	0.00> 1
linical skills expertise	(0.75) 2.98	(0.61) 4.01	6.6	0.00> 1
ontinuity of patient care	XXX	XXXX	XXX	XXX
xpenditure of emotional	(0.74) 3.39	(0.61) 3.94	4.14	0.00> 1
ork efficiency	(1.01) 2.93	(0.75) 4.1	6.19	0.00> 1
education experience				
uccessful teaching	(0.82) 2.69	(0.85) 3.82	5.56	0.00> 1
edical skills proficiency	(0.75) 3.37	(0.71) 3.92	3.16	0.003
uccessful learning	(0.83) 3.23	(0.79) 4.01	4.34	0.01> 01

:aff physician supervision	(0.80) 2.67	(0.92) 3.37	4.38	0.00> 1
otation disruptions	(0.75) 4.10	(0.98) 2.40	7.36	0.00> 1

Figures

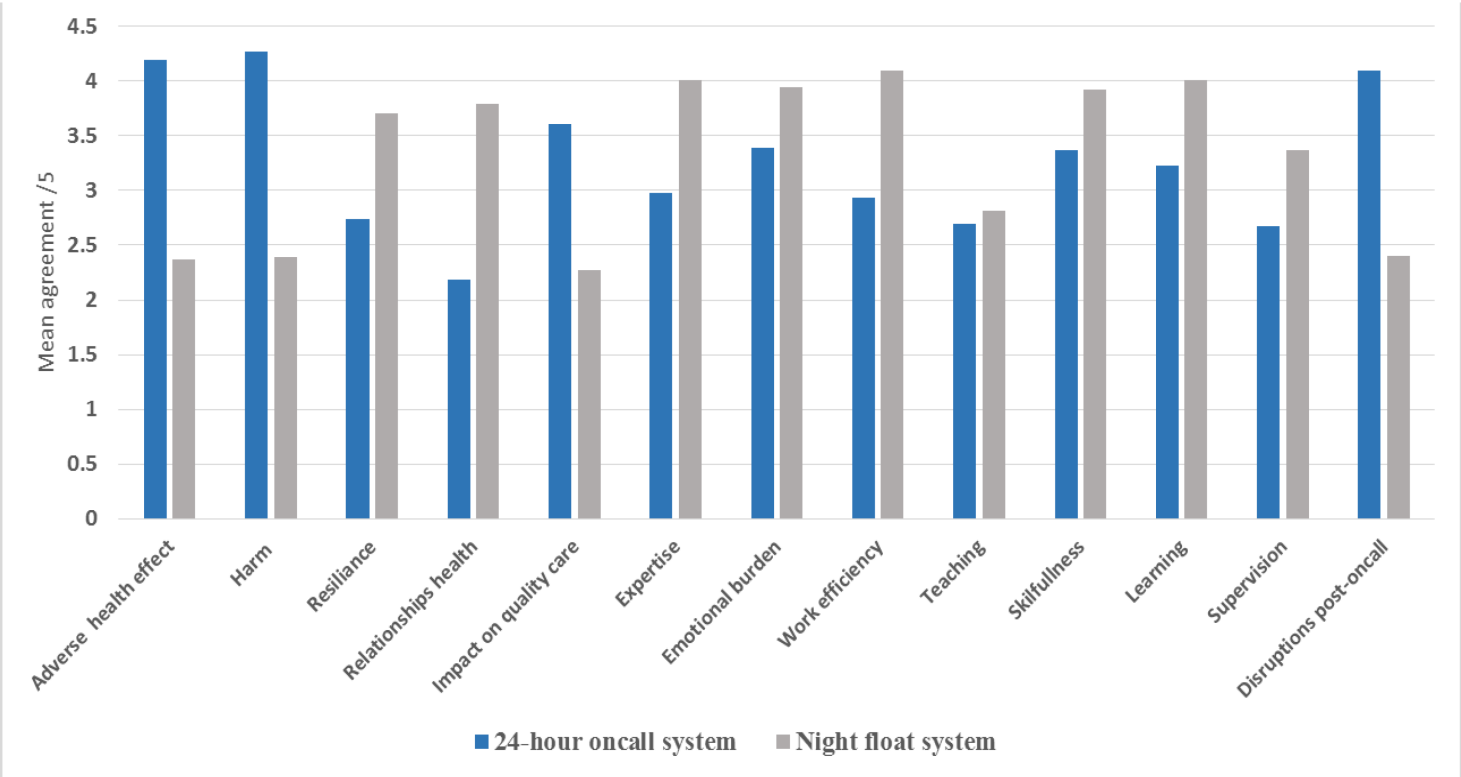

Figure 1

The medical residents mean perceptions of the two on-call systems

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- AppendixA.pdf